SUPPORTING DIVERSITY AND INCLUSION IN PHYSICS

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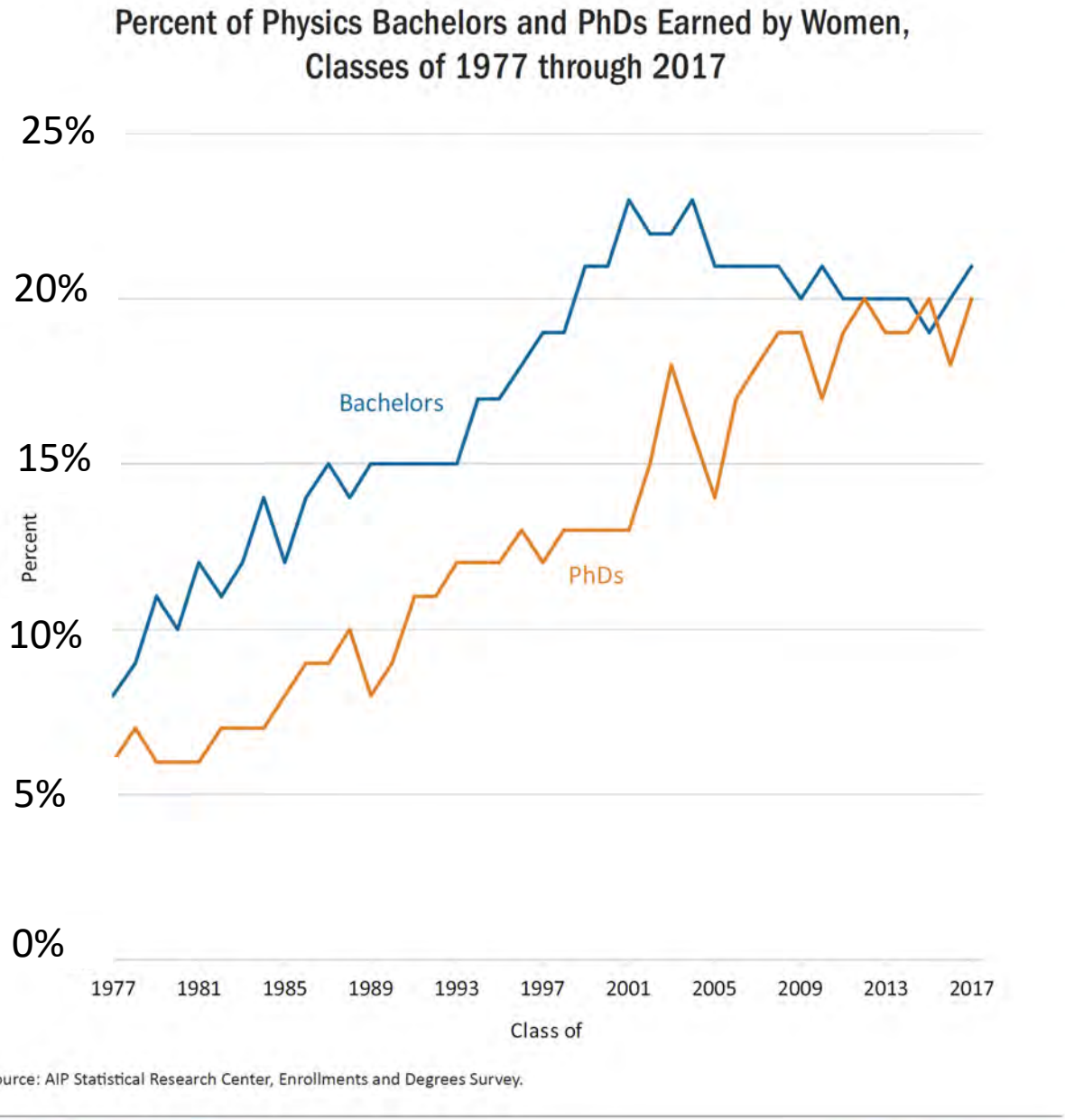
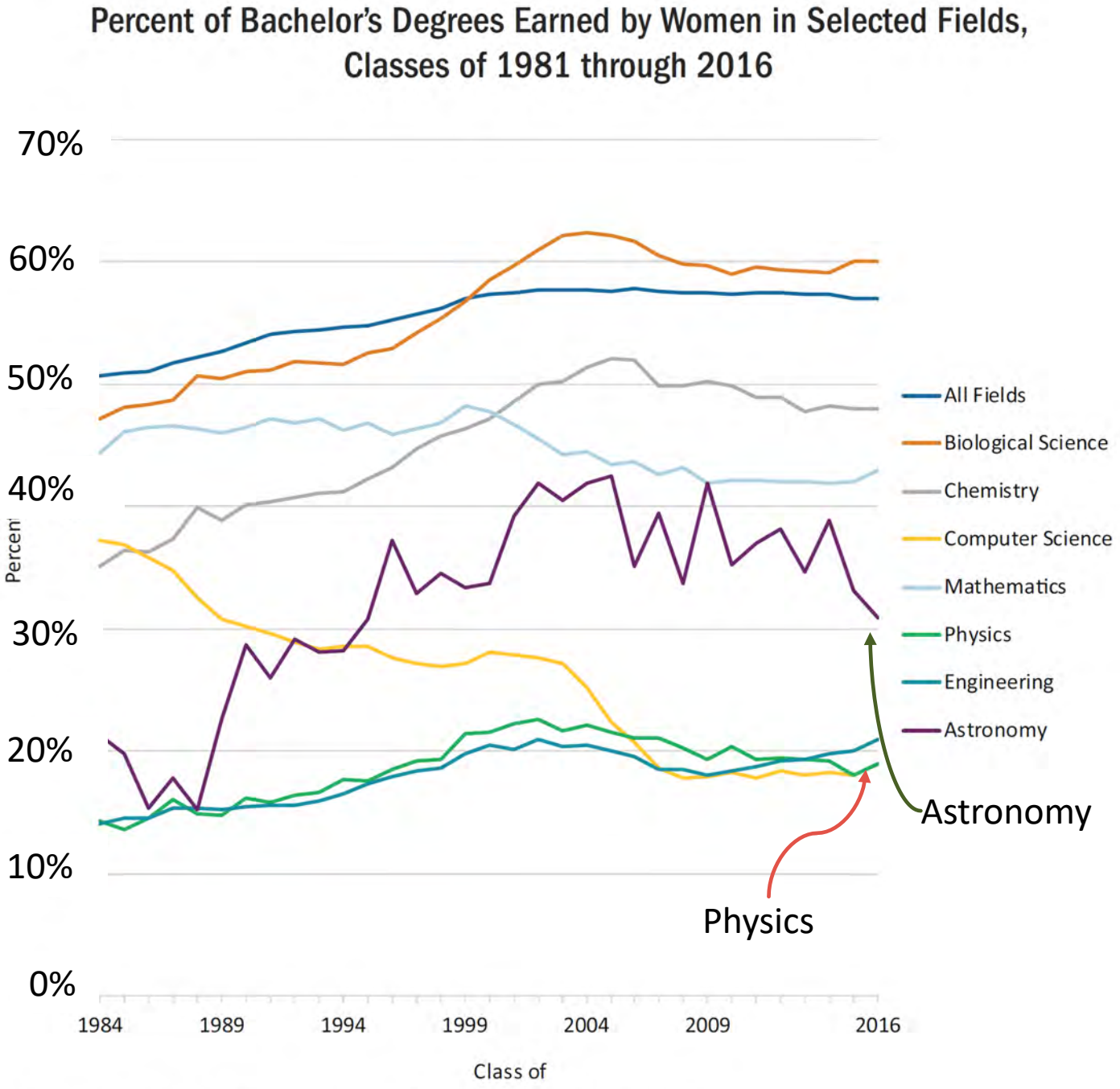
WELCOME!

DISCLAIMERS

- Topic can be uncomfortable
- Learning is uncomfortable!
- Happy to provide sources
- QR code/website on last slide—these slides
- Focus on gender; POC have it worse
- I love this topic = I talk fast!

WHY TALK ABOUT DIVERSITY AND PHYSICS?


Percent of Physics Bachelors and PhDs Earned by Women,
Classes of 1977 through 2017
25%
20%
15%
10%
5%
0%
Percent
Bachelors
PhDs
1977
1981
1985
1989
1993
1997
2001
2005
2009
2013
2017
Class of
Source: AIP Statistical Research Center, Enrollments and Degrees Survey.
AIP Statistics
aip.org/statistics


Percent of Bachelor's Degrees Earned by Women in Selected Fields, Classes of 1981 through 2016
70%
60%
50%
40%
30%
20%
10%
0%
Percen
1984
1989
1994
1999
2004
2009
2016
Class of
All Fields
Biological Science
Chemistry
Computer Science
Mathematics
Physics
Engineering
Astronomy
Astronomy
Physics
Source: National Center for Education Statistics. Data compiled by AIP Statistical Research Center

The Number of Doctorates Earned in Physics, 2014–15 to 2018–19

Number of Doctorates Earned in Physics by People who are:	2014–15	2015–16	2016–17	2017–18	2018–19
American Indian or Alaska Native men	5	0	1	2	2
American Indian or Alaska Native women	0	1	0	0	0
Asian men	56	55	61	66	70
Asian women	17	20	19	18	27
Black or African American men	13	15	16	8	8
Black or African American women	5	9	3	4	1
Hispanic or Latino men	34	40	50	42	40
Hispanic or Latino women	10	5	7	11	10
Native Hawaiian or Other Pacific Islander men	2	1	1	1	1
Native Hawaiian or Other Pacific Islander women	0	0	0	1	0
White men	639	650	648	609	651
White women	135	142	115	165	123
Two or more races men	9	11	11	24	22
Two or more races women	1	8	6	6	6
All Other Race/Ethnicity and Gender Combinations (NonResident Alien and Unknown)	915	889	894	923	914
Totals:					
Non-White Only	152	165	175	183	187
White Only	774	792	763	774	774
Grand Totals:					
Men	1,474	1,489	1,511	1,478	1,497
Women	367	357	321	402	378
All	**1,841**	**1,846**	**1,832**	**1,880**	**1,875**

These data are publicly available from the National Center for Education Statistics (NCES) here: https://nces.ed.gov/ipeds/use-the-data.

Minoritized races:

9.4% in 2018-29

Women:

20% in 2018-19

OK, SO WHAT?

- Waste of talent
  - What ideas have been lost?
  - How slowly have we made progress?
  - How much energy has been diverted from science?
  - How much money has been diverted from science?

- Moral issue
  - Serious inequity in our culture
  - Social justice issue
  - Systemic racism, sexism, etc.

DEFINITIONS

- EQUALITY
- EQUITY
- JUSTICE
- DIVERSITY
- INCLUSION
- INTERSECTIONALITY

Equality

The assumption is that everyone benefits from the same supports. This is equal treatment.

Equity

Everyone gets the supports they need (this is the concept of "affirmative action"), thus producing equity.

Justice

All 3 can see the game without supports or accommodations because the cause(s) of the inequity was addressed. The systemic barrier has been removed.

DIVERSITY VS. INCLUSION

Diversity is inviting someone to the party. Inclusion is asking them to dance. –Verna Myers

GENDER AND INTERSECTIONALITY

FACTORS CAUSING UNDER-REPRESENTATION

- Culture, not biology!
  - Harassment (3/4 of undergrad physics women!*)
  - Lack of role models
  - Lack of support
  - Societal messages
  - Microaggressions
  - Implicit Bias

*Aycock, Hazari, Brewe, Clancy, Hodapp, Goertzen. PHYSICAL REVIEW PHYSICS EDUCATION RESEARCH 15, 010121 (2019)

FACTORS CONTINUING UNDER-REPRESENTATION

- Work-home balance
- Microaggressions*
- Lack of support
- Gendered expectations
- Tokenism
- Sexual harassment

*Barthelemy, McCormick, Henderson doi:10.1119/perc.2014.pr.005

CULTURAL FACTORS

- Societal belief that women don't belong in science

- Implicit bias
- Stereotype threat
- Mindset

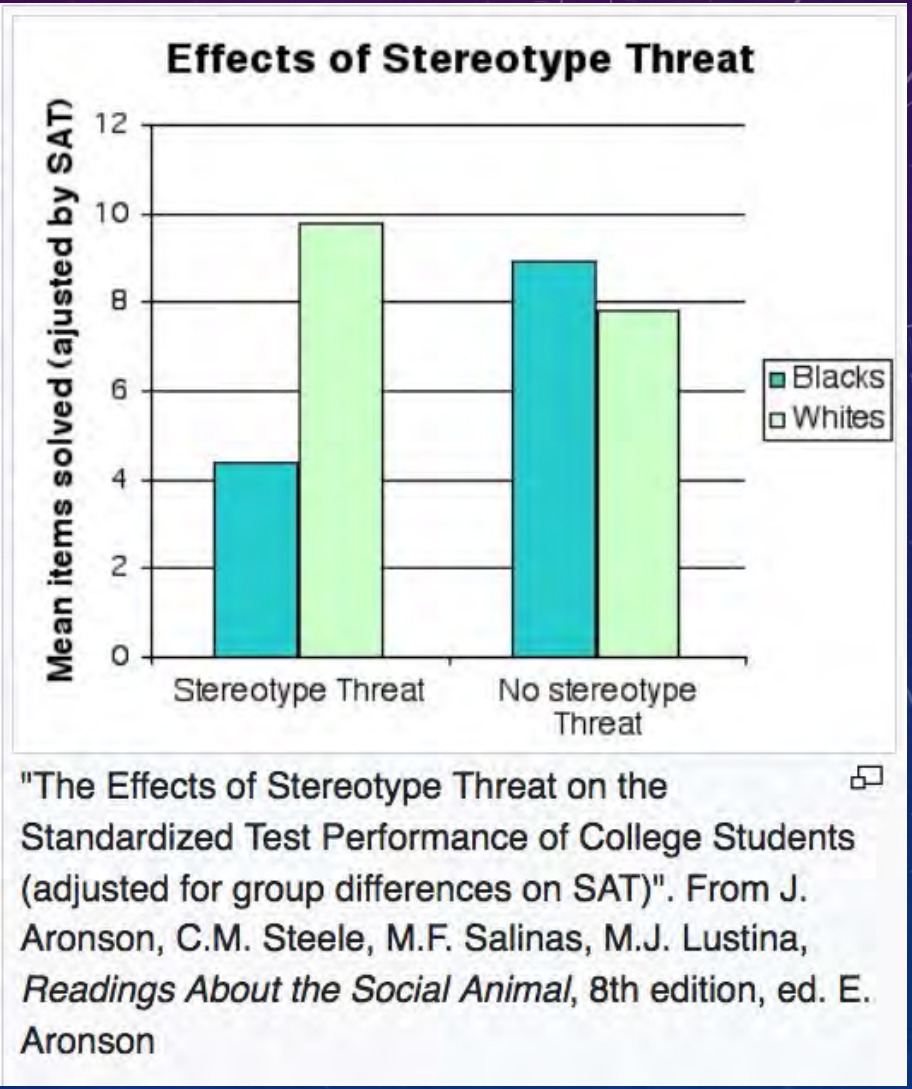
IMPLICIT (UNCONSCIOUS) BIAS

- Growing up → culturally instilled values
- Pervasive: everyone has them
- Separate from explicit biases (can be same or different)
- May differ from our declared beliefs
- Tend to favor our own in-group
- Malleable—thank goodness!

http://kirwaninstitute.osu.edu/research/understanding-implicit-bias/

STEREOTYPE THREAT

- Risk of confirming a negative stereotype
- Triggered by mentioning stereotype (or even being unconsciously aware of it)
- Changes performance of stereotyped groups



"The Effects of Stereotype Threat on the Standardized Test Performance of College Students (adjusted for group differences on SAT)". From J. Aronson, C.M. Steele, M.F. Salinas, M.J. Lustina, *Readings About the Social Animal*, 8th edition, ed. E. Aronson

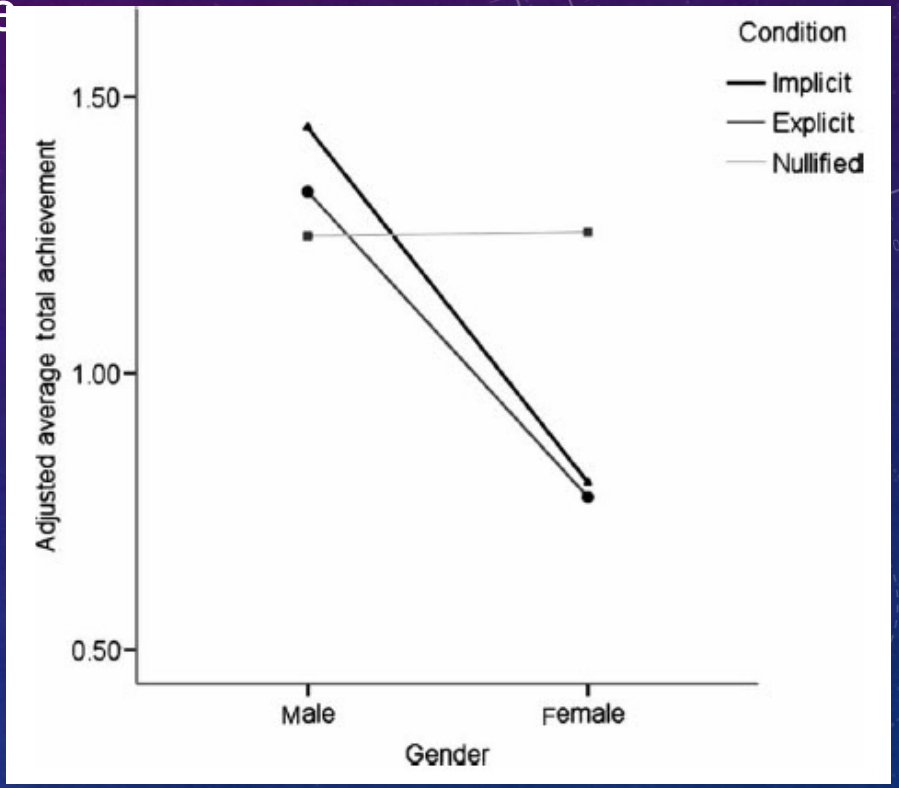
http://www.reducingstereotypethreat.org/
https://en.wikipedia.org/wiki/Stereotype_threat

STEREOTYPE THREAT IN PHYSICS

Implicit: You will be given four physics problems to solve. These problems are based on physics material that you have already covered.

Explicit: <Implicit plus> This test has shown gender differences with males outperforming females on the problems.

Nullified: <Implicit plus> gender differences in performance have been found on this test.



Gwen C. Marchand & Gita Taasoobshirazi (2012): Stereotype Threat and Women's Performance in Physics, International Journal of Science Education

MINDSET

- Fixed mindset: your qualities are set and unchangeable
- Growth mindset: your qualities can be cultivated and developed

https://www.mindsetkit.org/

MINDSET IN PHYSICS

"If a student had a growth mindset coming in to the class, that student had a statistically significant higher probability of achieving greater FCI gains than if the student had a fixed mindset.

The mean FCI gain of students identified as having a growth mindset was higher than the mean FCI gain of students identified as having a fixed mindset."

The Correlation between Student Growth Mindset and Conceptual Development in Physics. Flores, Lemons, McTernan. 2011.

HOW DO THESE AFFECT WOMEN?

- Implicit bias:
  - Women get lower evaluations, lower starting salaries, fewer job offers, etc.
  - Women's work is valued less than men's
- Stereotype threat:
  - Women's performance is lower than it should be
  - Self-doubt, less connection to field, less sense of belonging
- Mindset:
  - "Girls can't do science" vs. "Anyone can do science!"
  - Growth mindset improves women's performance more than men

WHAT CAN WE DO?

LOTS!

REDUCING BIAS

- Awareness
- Motivation
- Actions

The End of Bias: A Beginning. Nordell, 2021.

AWARENESS

- You’re here!
- Explore legit resources (APS, AIP, AAPT)
- Start looking at your local environment

MOTIVATION

- This talk?
- Push from within the department/organization

ACTIONS

REDUCING IMPLICIT BIAS

- Find your own biases (IAT at Harvard)
- Think about your biases
- Seek out counterexamples
- Learn about people to see them as individuals
- Practice empathy
- Set gradeschemes/rubrics/checklists ahead of time
- Give yourself time on decisions

https://tll.mit.edu/teaching-resources/inclusive-classroom/implicit-bias/

WHAT HELPS: UNDERGRADUATES

- Active SPS chapter
- Student lounge
- Engaged faculty
- CUWiP
- Mentors (peer and other)

- Data! Collect information and analyze

"What Works?" Whitten et al.

College of Arts and Sciences

Women in Physics

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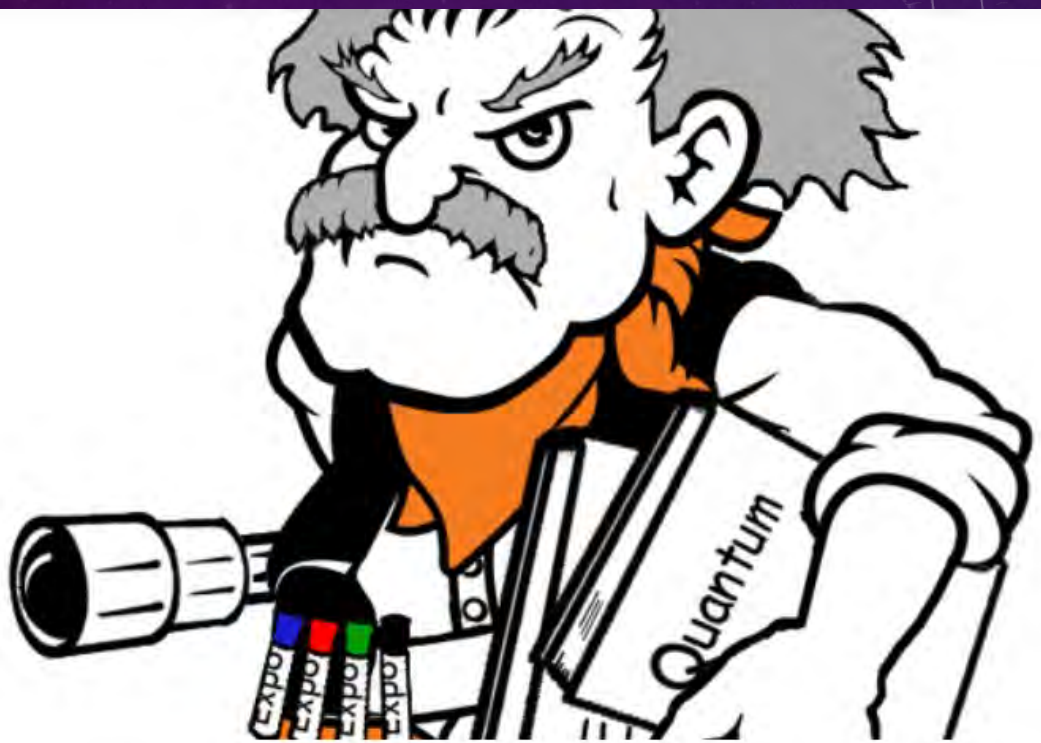
WELCOME TO WOMEN IN PHYSICS

UPCOMING EVENTS



SPS

Oklahoma State SPS

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Message

WHAT HELPS: GRADUATE STUDENTS

- Open study/support groups
- “Safe face”
- Career advising
- Mentoring
- Check-ins
- Advisor education

WHAT HELPS: CAREERS

- Value service obligations
- Observations: who talks? who is the social secretary?
- Data! (Climate survey)
- Spousal hires (Women 204% more likely to relocate for a spouse)
- Spend resources on equity
- Acknowledge employees are human
- Avoid comparing people to people; compare people to specific goals/objectives

ALL THE FEELS!

- Emotional topic
- Emotion = Engagement

PITFALLS/MISCONCEPTIONS

- You can become “woke” and be done
- Depression, anger, frustration without action
- Thinking you are a bad person because of unconscious bias
- Impatience with others
- Assuming (malicious) intent instead of ignorance
- Focus on past mistakes
- Wanting immediate visible changes

READY, SET, ACTION!

- Think about your daily routine
  - Where are places you are likely to be stereotyping?
  - Where are places you are likely to be biased?

ALL TOGETHER, NOW

- What is one action your club/study group can take to be more inclusive?
- What is one action to make your classroom more inclusive?
- What is one action to make a process more inclusive (hiring/tenure/performance evaluation)?

APS EP3 report/guidelines

KEEP GOING!

- Set a time to meet with others
- Start a reading group
- Find webinars, TED talks, podcasts, research
- Invite others to help
- Ally groups
- Get administrators involved

- Slow steps are progress!

THANK YOU!

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